



**National
Transportation
Safety Board**

Managing Fatigue Risk in Transportation: Challenges and Opportunities

Mark R. Rosekind, Ph.D.
Board Member

Fatigue Risk Management in Aviation Operations Symposium
George Mason University
May 1, 2013



- 1) determining the probable cause of transportation accidents
- 2) making recommendations to prevent their recurrence



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All Modes



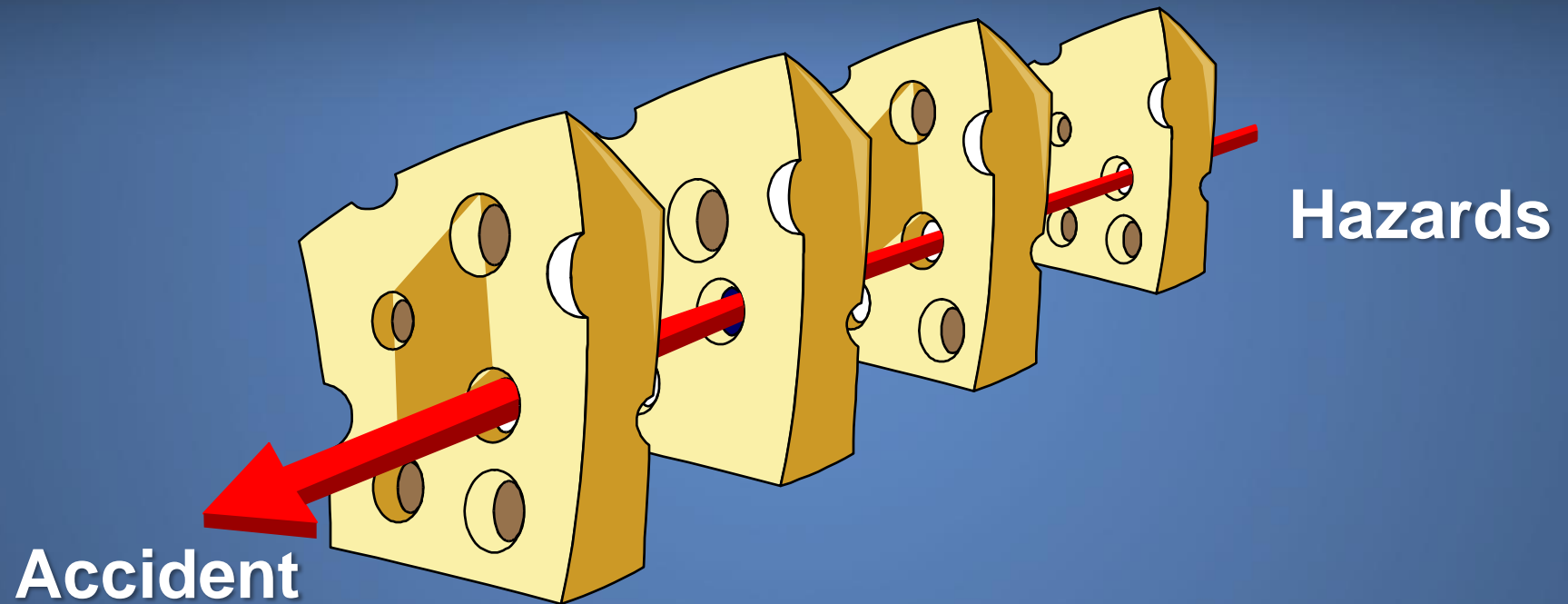
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Independent Federal Agency: Created in 1967

- ~ 132,000 accident investigations
- 13,500+ safety recommendations
- ~ 2,500 organizations/recipients
- 82% acceptance rate



“Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards



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NTSB Characterized as:

‘moral compass and industry conscience’

NTSB Chairman Deborah A.P. Hersman



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Challenges



Challenges of a 24/7 Society



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Four Fatigue Factors +

- Sleep loss
- Continuous hours of wakefulness
- Circadian/time of day
- Sleep disorders
- Other considerations



Fatigue Risks

Fatigue can degrade
every aspect of
human capability.



Fatigue Risks

- degraded 20 – 50%+:
 - reaction time
 - memory
 - communication
 - situational awareness
 - judgment
 - attention
 - mood
- increased:
 - irritability
 - apathy
 - attentional lapses
 - microsleeps



Uncontrolled In-Flight Collision with Terrain

AIA Flight 808, Douglas DC-8-61, N814CK

U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

First NTSB aviation accident investigation
to cite fatigue as probable cause

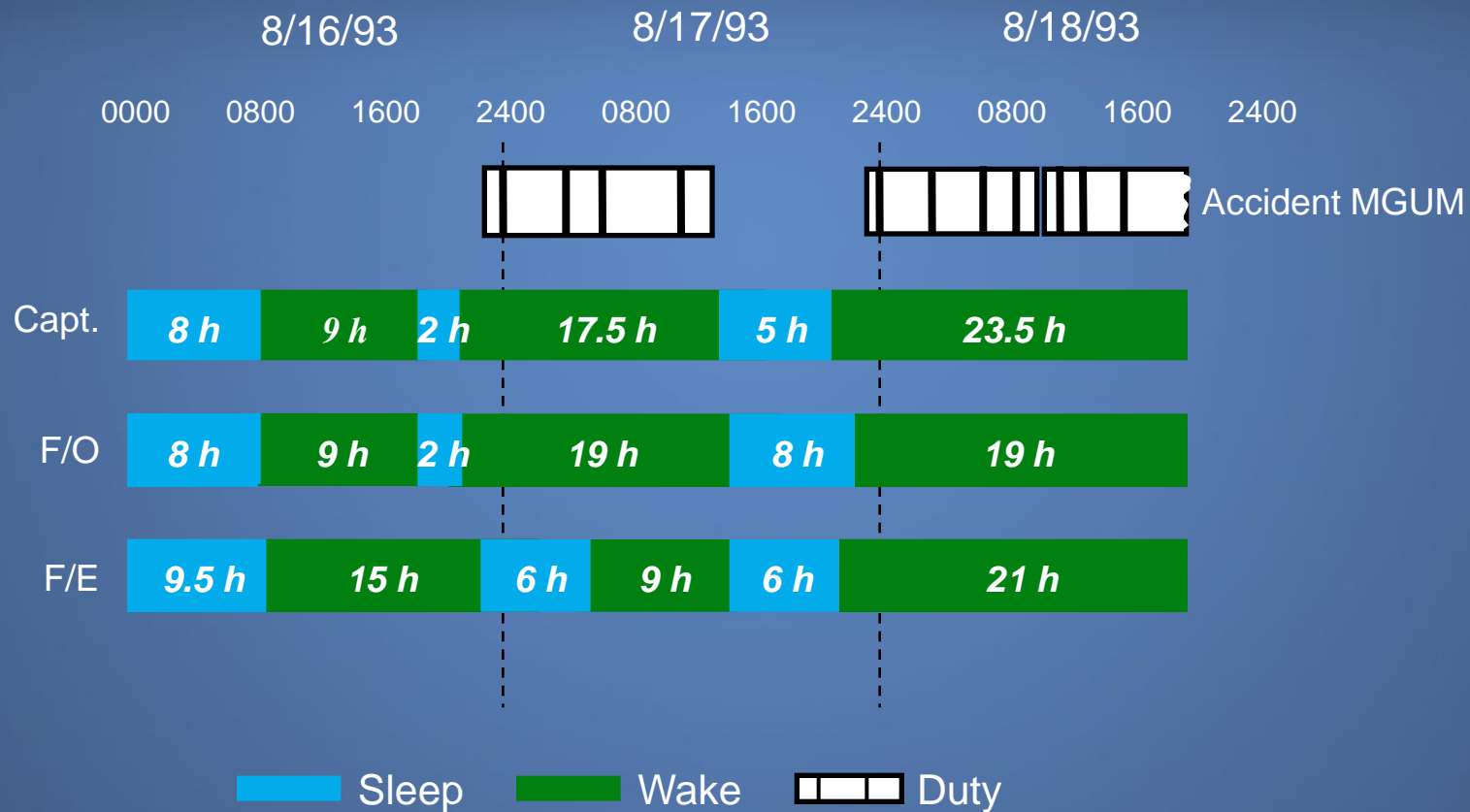


- acute sleep loss, sleep debt, circadian disruption



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Crew Sleep History



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Uncontrolled In-Flight Collision with Terrain
AIA Flight 808, Douglas DC-8-61, N814CK
U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

“The National Transportation Safety Board determines that the probable causes of this accident were the impaired judgment, decision making, and flying abilities of the captain and flight crew due to the effects of fatigue...”



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Owatonna, MN (July 31, 2008)



8 fatalities



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Owatonna Crew Fatigue Factors

- acute sleep loss (Capt/FO)
- cumulative sleep debt (FO)
- early start time (Capt/FO)
- excessive sleep need (Capt)
- insomnia (FO)
- self-medicate/prescription sleep med (FO)



Probable Cause/Contributing Factors

“Contributing to the accident were . . .
(2) fatigue, which likely impaired both
pilots’ performance; . . .”



Lubbock, TX (January 27, 2009)



2 injuries



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Probable Cause/Contributing Factors

“Contributing to the accident were . . .

4) fatigue due to the time of day in which the accident occurred and a cumulative sleep debt, which likely impaired the captain’s performance.”



Fatal Airline Accidents (Examples) (fatigue cited)

- 8/97 Guam: 228 fatalities
- 6/99 Little Rock AK: 11 fatal
- 10/04 Kirksville MO: 11 fatalities
- 8/06 Lexington KY: 49 fatalities
- 7/08 Owatonna MN: 8 fatalities
- 2/09 Buffalo NY: 49 fatalities



Miami, Oklahoma (June 26, 2009)

Fatigue Factors

- Off work for 3 weeks: day active/night sleep schedule
- 3am to 3pm shift work/drive schedule (since 1997)
- Early bedtime (2 hr phase advance in sleep time)
- Obtained min 3 hrs/max 5 hrs sleep prior to accident
- Subsequently diagnosed with mild sleep apnea



10 fatalities
3 serious injuries
2 minor injuries
5 no injuries

**Ford
Windstar**

**Kia
Spectra**

**Hyundai
Sonata**

Source: Oklahoma State Police



Probable Cause (fatigue)

“ . . . driver’s fatigue, caused by the combined effects of acute sleep loss, circadian disruption associated with his shift work schedule, and mild sleep apnea, which resulted in the driver’s failure to react to slowing and stopped traffic ahead by applying the brakes or performing any evasive maneuver to avoid colliding with the traffic queue. . . . ”





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Animation of Accident Reconstruction

Motorcoach Run Off Road-Collision with Bridge Signpost

Interstate Highway 95 Southbound

New York, New York

March 12, 2011

HWY11MH005



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'Bronx Bus', New York, NY (March 12, 2011)



15 fatalities
17 injuries



Probable Cause

“The National Transportation Safety Board determines that the probable cause of the accident was the motorcoach driver's failure to control the motorcoach due to fatigue resulting from failure to obtain adequate sleep, poor sleep quality, and the time of day at which the accident occurred.”



Opportunities



NTSB Safety Recommendations: Fatigue

- 40 years ago: May 10, 1972
- “Revise FAR 135 to provide adequate flight and duty time limitations.” (A-72-55)
- Classified “Closed-Unacceptable”





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MOST WANTED LIST

A program to increase the public's awareness of, and support for, action to adopt safety steps that can help prevent accidents and save lives. The following are ten of the current issues.



Addressing Human
Fatigue



General Aviation
Safety



Safety Management
Systems



Runway Safety



Bus Occupant Safety



Pilot & Air Traffic
Controller
Professionalism



Recorders



Teen Driver Safety



Addressing Alcohol-
Impaired Driving



Motorcycle Safety



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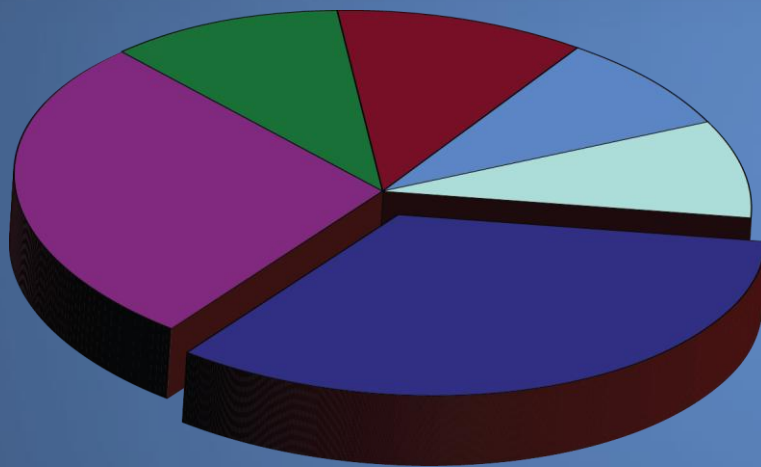
NTSB Safety Recommendations: Fatigue

- MOST WANTED 1990 - 2012
- ~200 fatigue recommendations



Complex Issue:

Requires Multiple Solutions



- Scheduling Policies and Practices
- Education/Awareness
- Organizational Strategies
- Healthy Sleep
- Vehicle and Environmental Strategies
- Research and Evaluation



NTSB Fatigue Recommendations: Education/Strategies

- Develop a fatigue education and countermeasures training program
- Educate operators and schedulers
- Include information on use of strategies: naps, caffeine, etc.
- Review and update materials



Scheduling Policies and Practices

Victoria, Texas, January 2, 2008



Victoria, Texas Fire Department

- Day sleep, night drive, ~ 4 am WOCL



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NTSB Fatigue Recommendations: Hours of Service / Scheduling

- Science-based hours of service
- Allow for at least 8 hours of uninterrupted sleep
- Fatigue mitigation strategies in the hours-of-service regulations for passenger-carrying drivers who operate during the nighttime window of circadian low
- Reduce schedule irregularity and unpredictability



Sleep Apnea

Mexican Hat, UT, January 6, 2008



- 360 rollover, 50/53 ejected, 9 fatalities, OSA (-CPAP)



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NTSB Fatigue Recommendations: Sleep Apnea/Health Related

- Develop standard medical exam to screen for sleep disorders; require its use
- Educate companies and individuals about sleep disorder detection and treatment, and the sedating effects of certain drugs
- Ensure drivers with apnea are effectively treated before granting unrestricted medical certification

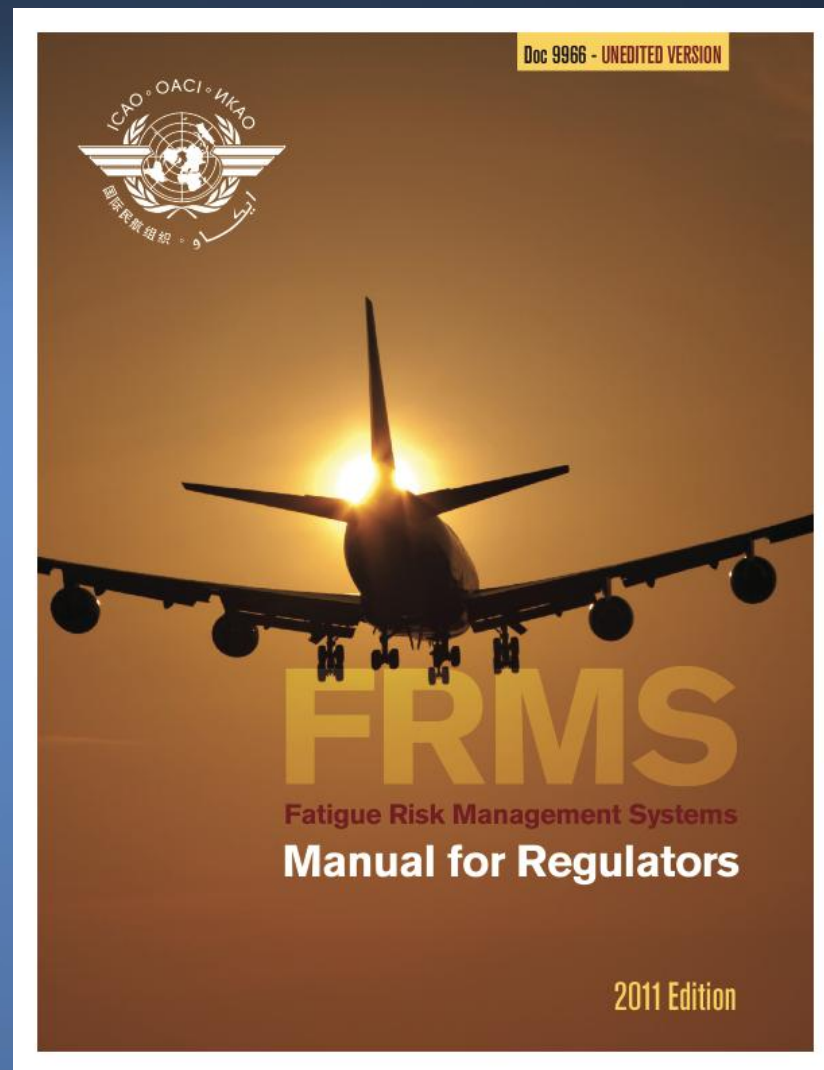
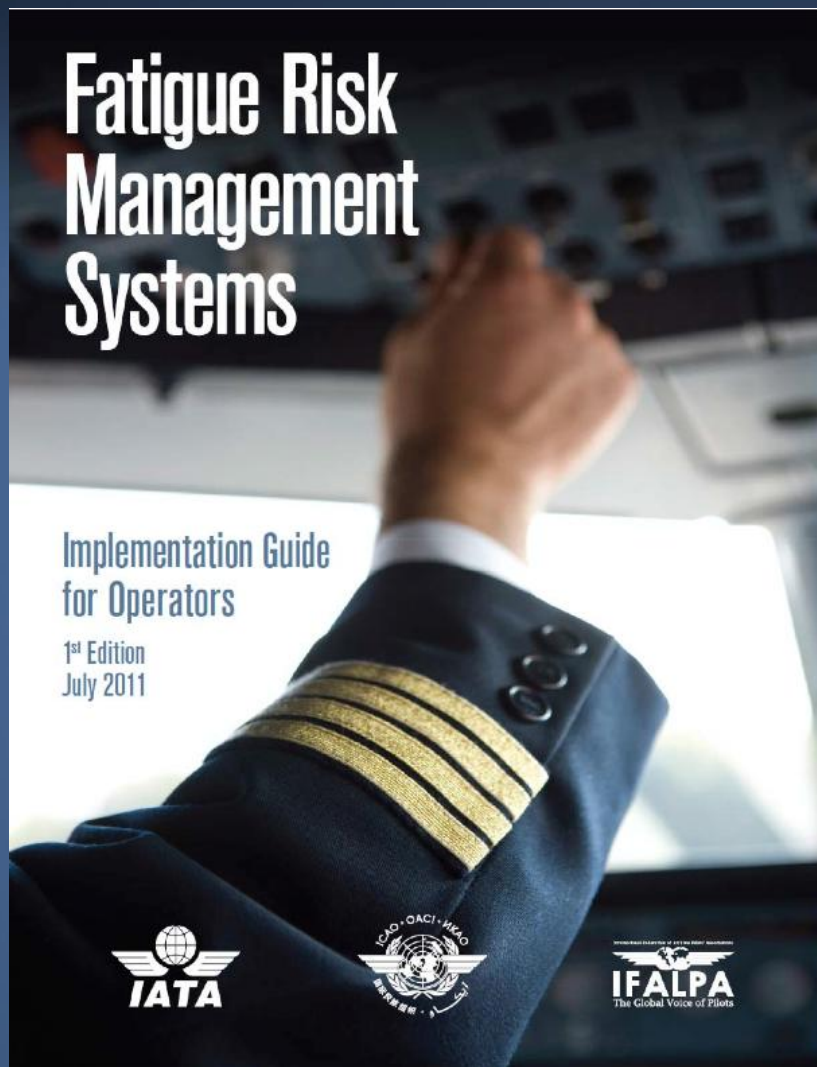


NTSB Fatigue Recommendations: Fatigue Management Systems

- Develop guidance based on empirical and scientific evidence for operators to establish fatigue management systems
- Establish an ongoing program to monitor, evaluate, report on, and continuously improve fatigue management programs implemented by motor carriers to identify, mitigate, and continuously reduce fatigue-related risks for drivers.



Examples



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New Hours of Service Regulations In 2011: Rail, Aviation, and Trucking

- Education activities
- Sleep apnea programs
- Fatigue Risk Management

Acknowledgment to action



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NTSB Safety Recommendations: Fatigue Status (May, 2012)

- Total: 194
- Open: 48
- Closed: 146
- CUN*: 26

CUN = closed unacceptable



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Go! Flight 1002



- early starts, multiple segment days, sleep apnea



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GA Accident: GULF OF MEXICO (February 17, 1994)

THE PILOT FELL ASLEEP WHILE ENROUTE FROM SPRINGFIELD, KY TO CROSSVILLE, TN WHEN HE AWOKE 5 HOURS LATER HE FOUND THAT HE WAS OVER THE GULF OF MEXICO, 210 MILES SOUTH OF PANAMA CITY, FL, AND HAD ONLY 20 MINUTES OF FUEL REMAINING. HE DECLARED MAYDAY ON 121.5 AND WAS ASSISTED BY COAST GUARD AND AIR FORCE AIRCRAFT. THEY DIRECTED HIM TO THE NEAREST AIRPORT, ST. PETERSBURG, FL WHILE ENROUTE TO THE AIRPORT THE ENGINES QUIT DUE TO FUEL EXHAUSTION AND THE AIRCRAFT WAS DITCHED, 70 MILES WEST OF ST. PETERSBURG. HE WAS RESCUED BY A COAST GUARD HELICOPTER.



NTSB

GA Accident: GULF OF MEXICO (February 17, 1994)

- The National Transportation Safety Board determines the probable cause(s) of this accident to be:

THE PILOT'S PHYSIOLOGICAL CONDITION (FAILURE TO REMAIN AWAKE) RESULTING IN EXTENDED FLIGHT OVER WATER FOLLOWED BY FUEL EXHAUSTION, TOTAL LOSS OF ENGINE POWER, AND DITCHING BEFORE RETURNING TO LAND.



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Honorable John K. Lauber:

No Accident \neq
Safe Operation



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Manage Fatigue = Enhance Safety

- Acknowledge risks
- Educate everyone
- Strong policies
- Take action/use strategies!
- Promote culture change





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